Testimony of

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On Financial Services Sector Preparedness
in a Post 9/11 Environment

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Thank you Chairman Platts, Ranking Member Towns, and members of the Subcommittee for inviting me to testify before you today to discuss the financial sector's preparedness for wide-scale disasters or disruptions. Congressman Towns, it is a pleasure to appear in your district today at the Brooklyn Law School. We greatly appreciate this Subcommittee's interest in oversight and preparedness. Events which have occurred over the last few years – terrorist attacks, power grid failures, and hurricanes – all remind us that those who own and manage critical infrastructure must be prepared to provide continuous service through whatever may come and maintain plans for disaster recovery.

On behalf of the nearly 800 employees of the Nasdaq Stock Market, I am proud to say that it has always been our highest priority at NASDAQ to maintain a hardened, resilient operation that can withstand catastrophic events. I am the officer responsible for the operations of our market and for maintaining our business continuity plans. I can tell you firsthand that we have devoted all necessary time and resources, and have worked

cooperatively with investors, listed companies, our market participant customers, and the government.

If I were to emphasize just a few basic principles at the outset, they would be as follows:

(1) NASDAQ and our nation's other capital markets are a critical national infrastructure. It is imperative that we take this responsibility seriously and be prepared to operate at all times. NASDAQ views business continuity and disaster recovery as critical top level priorities.

(2) Following NASDAQ's lead, the exchange model in the U.S. is evolving towards electronic trading, and this will enhance naturally the capital markets' ability to withstand catastrophic events.

(3) NASDAQ believes that business continuity planning is a team effort. We need to work cooperatively with the industry, investors, and the government. A stock market alone does not represent our capital markets; instead it is only as good as its weakest link.

(4) Finally, America needs to remain steadfastly on guard for natural or man-made disasters, but this Subcommittee and all Americans should know that NASDAQ and the other participants in our industry understand our critical role in the nation's economy and are prepared.

NASDAQ's Market Structure

At the outset, I want to emphasize that NASDAQ's operating model provides us with a natural and tremendous business continuity advantage. Historically, an exchange

operated in a central physical location where buyers and sellers or their representatives would meet face-to-face to trade. Given the challenges our country now faces, an exchange with a single central location without a practical and fully tested capability of backup and related continuity planning puts our nation's capital markets at risk.

In contrast, NASDAQ was created in 1971 by the National Association of Securities Dealers, at the behest of the Securities and Exchange Commission, to use computers to collect and display quotation information in the over-the-counter market. From these rather humble beginnings, NASDAQ has become the second largest equities market in the world in terms of the number of listed companies, overall trading volume, and trading value; and, we are a global leader in using technology to revolutionize the way equities are bought and sold.

Trading at NASDAQ is executed through our sophisticated computer and telecommunications network. Today, NASDAQ connects thousands of traders in hundreds of firms dispersed throughout North America. Data is received from more than 350,000 terminals and workstations and more than 2 million users in 83 countries have access to screens displaying NASDAQ data. On a typical day, NASDAQ's systems process 37 million stock price quotation updates, 88 million buy and sell orders, and 5 million trades. We handle processing peaks in excess of 25,000 transactions per second and maintain less than $1/100^{th}$ of a second transaction processing time, all with greater than 99.99% uptime for our trading systems. Recently, InfoWorld Magazine named

NASDAQ as 36th among the top 100 companies for information technology achievements, and 5th among financial services companies.

Today, NASDAQ lists the securities of over 3,200 of the world's leading companies, representing the entire spectrum of the U.S. economy—from information technology and telecommunications to agriculture, manufacturing and finance. NASDAQ's "open architecture" market structure places virtually no limit on the number of market participants that can provide liquidity on NASDAQ and imposes little geographical restriction on where these market participants are located.

Unlike its physical floor-based peers, which employ a single specialist to direct the buying and selling of a company's stock, NASDAQ utilizes hundreds of geographically diverse and competing market makers who provide the trading liquidity for each security listed on our market. As an example, today there are exactly 134 registered market makers providing liquidity to support the trading of the Microsoft Corporation (symbol MSFT). This not only ensures a healthy competitive environment for investors, but also prevents a single point of failure from a business continuity standpoint given the geographic diversity of our market makers. The NASDAQ model also provides within its market model open access to all alternate trading systems, including ECNs, or Electronic Communications Networks. These ECNs provide electronic facilities that investors can use to trade directly with each other and, in addition to providing a competitive trading environment, extend the geographic diversity and resilience of the NASDAQ model beyond the aforementioned market makers to trade execution venues.

The rest of the world's capital markets have adopted the NASDAQ model, but in the United States the other exchanges have been slow to move away from the floor-based open outcry system. This is now changing, as investors have demanded better, more efficient systems and the Securities and Exchange Commission has adopted a new rule, Regulation National Market System ("Reg NMS"), to encourage electronic trading.

NASDAQ and Business Continuity

Today, NASDAQ sets the standard for excellence in industry-wide terrorism preparedness and contingency planning. The outcome of NASDAQ's long standing planning, investment, implementation, and testing of continuity initiatives has been evident in all recent events. NASDAQ was prepared for, and resilient to, the events of 9/11; our systems remained fully operational throughout the week although we chose to close after consultations with the government and industry. NASDAQ was also prepared for, and resilient to, the blackout of August 2003 when the northeast power grid failed. NASDAQ's resilience during such large scale events is due in part to our focus on ensuring that redundancy backup and geographical diversification are an integral part of our operation.

NASDAQ has offered strategic guidance to both the government and the private sector. In addition, the FBI, Navy, various military officials, our market participant customers and, most recently, the Secretary of the Treasury, have toured our technology facilities to

learn from us about continuity and disaster recovery. We are proud to meet this responsibility to help secure America's financial markets against a catastrophe.

I would now like to discuss NASDAQ's operating model and business continuity plans in more detail. Thereafter, I will highlight lessons learned from these catastrophic events and how we prepare for unknown events.

First, geography is critical to NASDAQ's operational resiliency. We have two data centers that are more than 300 miles apart. Our Northeast Data Center in Connecticut has been in operation since 1971, and our mid-Atlantic Data Center, which until recently was located in Maryland, has been in operation for 17 years. This data center was moved in September 2005 to an undisclosed location further from Washington D.C. that better satisfies our requirements for security, resiliency, and geographic diversity.

Our geographic diversity minimizes the risk of a single catastrophic event impacting both of our data centers. The data centers are located in different geologic and climatic zones and are on diverse regional power grids. Our primary data center is housed in a rural corporate park, where we have two diverse utility power feeds and are permitted to maintain 35,000 gallons of diesel fuel on-site – something we could not do in Manhattan. This fuel permits us, in the event of an emergency, to run the primary center on four 1,500 KW Detroit Diesel generators that can be powered for a full week without a fuel refill. We also maintain 185 tons of batteries for additional back-up. We test each of our

generators weekly, and perform a utility failure test across the entire infrastructure every 90 days.

It is NASDAQ's view that, in addition to what is accomplished through geographic diversity, resiliency must also be achieved with locally situated systems and networks. From a telecommunications perspective, NASDAQ utilizes several extranet/network providers, each with diverse network connectivity into our two data centers. Market participants have the option of selecting one or more of these providers, ensuring maximum protection. By design, each of these market participants has diverse access to our primary data center, and also has automatic diverse connectivity to our backup data center, a design which maximizes the likelihood of operational continuity of our market following a widespread event.

9/11 And Its Aftermath

Immediately following the tragic events of 9/11, NASDAQ evaluated the extent of any damage to our system and our market participants, and set about determining the necessary steps to reopen the market. In so doing we were guided by four principles: First, we would do nothing that impeded the rescue effort. Second, we would closely coordinate all our activities with the SEC. Third, we would open our market only when major market participants were fully prepared and, preferably, simultaneously with other markets. Finally, in this crisis we would reach out to and assist our members and issuers, just as we do every day.

These principles were widely shared and contributed to the suspension of trading in all markets for four business days. However, at no time throughout the week of 9/11 were NASDAQ's systems inoperative. At the time of the attacks, trading was suspended but NASDAQ's systems and network continued to operate. As a result, our primary concern was focused on our ability to connect to firms that are active in our marketplace and bring liquidity and order flow. In fact, NASDAQ's systems continued to operate throughout the day of 9/11 to allow firms to access our systems so that they could reconcile their books and straighten out their affairs, and for mutual fund pricing and other activities to be completed properly. Although actual stock trading was operationally suspended, NASDAQ's systems operated continuously throughout the rest of the week for this purpose and to allow firms to test connectivity in preparation for the resumption of trading on September 17th.

In the week that followed, NASDAQ worked closely with all participants including the government, each of the equity and options exchanges and our own market makers, ECNs and the over 4,000 companies that listed their shares with us at that time. All told -- and working around the clock -- NASDAQ employees provided technological support to over 800 NASDAQ and non-NASDAQ participants in the financial services industry, domestic and foreign. We consider it a national triumph that trading resumed on Monday, September 17. We are grateful to the many institutions and individuals who made that happen and we are proud of our role in the process.

Notwithstanding this success, after 9/11 NASDAQ identified and implemented improvements in our backup systems. We added more frequent testing to our backup site. Testing, which had been quarterly, was increased to monthly and we now selectively invite market participants to take part. Annually, we also host a full market-wide disaster recovery test that is open to all NASDAQ market participants. During a recent industry-wide disaster recovery test, market participants representing 75% of our daily share volume tested successfully. In collaboration with State and Federal authorities we also evaluated and increased our physical security by broadening the buffer zone around our data center; implementing a fingerprinting policy for all employees and contractors; establishing a separate facility for receiving, x-raying, and opening all U.S. and commercially delivered mail and packages; implementing a single facility entryway with body and personal effects x-ray screening; and increasing the security access credential requirements to all data center buildings, including biometric readers for access control to the computer rooms.

2003 Blackout

Just two years later came another test: the blackout of August 14, 2003. The blackout again proved the worthiness of our ongoing contingency planning and testing. Although large portions of the northeastern United States were out of business, NASDAQ was fully operational during the blackout. NASDAQ's alternate power systems automatically provided immediate continuity so that there was no impact on our operations for the day. All infrastructure systems functioned as designed and seamlessly supported the full operation of our trading systems and networks at our primary data center site. As well,

NASDAQ's backup site remained unaffected, validating our geographic diversification strategy. For Wall Street, trading resumed the morning after August 14. Most firms were able to access their backup sites and were well prepared for business continuity.

The Blackout revealed some areas of weakness in the financial sector that need ongoing attention such as the need for further geographic diversity and more redundant telecommunications systems. There is a clear need for more back-up facilities outside of high risk metropolitan areas like New York City. We also noted that although most large market participants and all telecommunications providers had back-up systems and procedures in place, a lack of robustness and routine testing and maintenance revealed a substandard level of achievable resilience. For example, there were several examples of back-up generators that were immediately activated when the power failed but eventually failed within the following twelve hours because of poor diesel fuel quality or machine maintenance.

Looking Forward

Since 9/11, NASDAQ has worked closely in partnership with the Federal government and the private sector to evaluate our industry's strengths and weaknesses and to continue to strengthen the resiliency of the nation's financial infrastructure. We participated in the GAO's study that resulted in the February 2003 report to congressional requestors on "Potential Terrorist Attacks – Additional Actions to Better Prepare Critical Financial Market Participants." We have also testified on numerous occasions.

One example of this strengthening is NASDAQ's announcement of a contingency plan to trade NYSE-listed stocks if the NYSE is ever unable to operate both its primary and backup systems. After 9/11, the SEC requested that NASDAQ and the NYSE develop plans to provide a reciprocal trading capability in the event of an emergency. After consultation with the SEC and months of preparation, NASDAQ is now able to trade all NYSE and AMEX stocks if their respective trading floors were rendered inoperative for an extended period of time. In effect, in the event of a catastrophic New York metro emergency, NASDAQ is fully capable of trading all 6,700 U.S. Securities listed on NYSE, AMEX, and NASDAQ on our geographically diverse and resilient network. NASDAQ currently provides its market participants on a daily basis the ability to trade all NYSE- and AMEX-listed stocks electronically on the NASDAQ network. Today, nearly 18% of the overall daily NYSE share volume is traded on NASDAQ in this manner. We are the 13th largest volume participant accessing the NYSE floor today. The point here is that NASDAQ's reciprocal trading capability is operationally in effect on a daily basis. Regulation NMS is expected to dramatically increase the electronic trading capability of NYSE stocks, further enhancing the resiliency of our capital markets.

Conclusion

NASDAQ is continually anticipating, evaluating, and preparing for what we expect may occur one day. I must note that our preparedness will never be 100% perfect as it will tend to be limited by our human imagination of what might occur. This process is continuous and dynamic, and as time progresses more complete in terms of increasing our ability to withstand the unexpected. Our increasingly decentralized, geographically

diverse operating model continues to provide us with a high degree of confidence that we will be prepared for the next event.

I would like to conclude by discussing briefly the preparedness of our capital markets in general, both in the past four years and today. The key point is the crucial importance of redundancy, geographical and otherwise. NASDAQ avoided disaster in ’01 and ‘03 not by hardening any single point of failure, but by redundant systems and networks both locally and with geographic diversity. Our resilience to catastrophe lies in our geographically decentralized network and our several levels of redundancy. Although the recovery of America’s financial markets was extraordinary after 9/11, there is a need for more back-up facilities outside high-risk environments such as New York City. Stronger telecommunication systems are also critical.

The other major point here is that the industry is irreversibly moving towards electronic trading, and this is good news for resiliency. With electronic trading, an exchange need no longer be tied to a place. Rather, it can be maintained redundantly in multiple places and run by multiple systems, and redundancy is the key to security against any form of accident or attack. What is best for investors and for markets overall is also best for our financial and national security. For financial markets, we believe this is a core lesson of 9/11 and the blackout. For the Committee and for all concerned branches of the government, we believe it is a crucial lesson as well.

Thank you again, and I welcome any questions you may have.